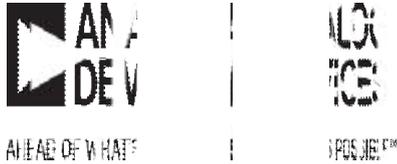


Analog Devices

This article is about the semiconductor company. For the general concept, see [Analog device](#).

Analog Devices, Inc.



Analog Devices headquarters in Norwood, Massachusetts

Type	Public
Traded as	<ul style="list-style-type: none">NASDAQ: ADINASDAQ-100 componentS&P 500 component
ISIN	US0326541051
Industry	Semiconductors
Predecessor	Precision Monolithics
Founded	Cambridge, Massachusetts, United States (1965)
Founders	Ray Stata Matthew Lorber
Headquarters	Norwood, Massachusetts, U.S.
Key people	Vincent Roche, CEO & President,

	Raymond Stata , Chairman of the Board
Products	Semiconductors
Revenue	▲ US\$6.2 billion (2018) ^[1]
<u>Operating income</u>	▲ US\$1.055 billion (2017) ^[2]
<u>Net income</u>	▼ US\$727 million (2017) ^[2]
<u>Total assets</u>	▲ US\$21.141 billion (2017) ^[2]
<u>Total equity</u>	▲ US\$10.162 billion (2017) ^[2]
Number of employees	15,300 ^[2] (2017)
Website	www.analog.com

Analog Devices, Inc. (ADI), also known simply as **Analog**, is an [American multinational](#) semiconductor company specializing in [data conversion](#), [signal processing](#) and [power management](#) technology, headquartered in Norwood, Massachusetts.^{[3][4]} In 2012, Analog Devices led the worldwide data converter market with a 48.5% share, according to analyst firm Databeans.^[5]

The company manufactures analog, mixed-signal and [digital signal processing \(DSP\)](#) integrated circuits (ICs) used in electronic equipment.^{[6][7]} These technologies are used to convert, condition and process real-world phenomena, such as light, sound, temperature, motion, and pressure into electrical signals.^[8]

Analog Devices has approximately 100,000 customers^[9] in the following industries: communications, computer, instrumentation, military/aerospace, automotive, and consumer electronics applications.^[4]

□

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History

The company was founded by two [MIT](#) graduates, [Ray Stata](#) and Matthew Lorber in 1965.^[10] The same year, the company released its first product, the model 101 op amp,^[11] which was a hockey-puck sized module used in test and measurement equipment.^[12] In 1967, the company published the first issue of its technical magazine, Analog Dialogue.^[13]

In 1969, Analog Devices filed an [initial public offering](#)^[14] and became a [publicly traded company](#). Ten years later, the company was listed on the New York Stock Exchange.^[15]

In 1973, the company was the first to launch laser trim wafers and the first CMOS digital-to-analog converter.^[11] By 1996, the company reported over \$1 billion in company revenue.^[16] That same year, Jerald Fishman was named President and CEO, a position he held until his death in 2013 (see below).^{[17][18]}

In 2000, Analog Devices's sales grew by over 75% to \$2.578 Billion and the company acquired five companies including BCO Technologies PLC, a manufacturer of thick film semiconductors, for \$150 million.^{[16][19]}

In January 2008, [ON Semiconductor](#) completed the acquisition of the CPU Voltage and PC Thermal Monitoring Business from Analog Devices., for \$184 million.

By 2004, Analog Devices had a customer base of 60,000 and its portfolio included over 10,000 products.^[16]

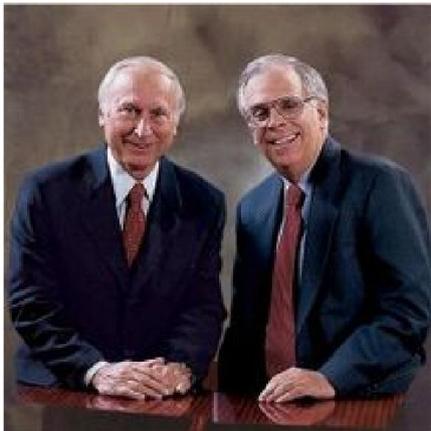
In July 2016, Analog and [Linear Technology](#) agreed that Analog would acquire Linear in an approximately \$14.8 billion cash and stock deal.^{[20][21]}

Locations

Analog Devices is headquartered in [Norwood, Massachusetts](#), with regional headquarters located in [Shanghai, China](#); [Munich, Germany](#); [Limerick, Ireland](#); and [Tokyo, Japan](#).^[22]

Analog Devices has fabrication plants located in the United States and in Ireland. The company's testing facility is located in the [Philippines](#). Design centers are located in [Australia](#), [Canada](#), [China](#), [Egypt](#), [England](#), [Germany](#), [India](#), [Israel](#), [Japan](#), [Scotland](#), [Spain](#), [Taiwan](#) and [Turkey](#).^[22]

Employees



Ray Stata and Jerry Fishman

[Raymond Stata](#) is a founder of Analog Devices and was responsible for the business strategy and product roadmap.^{[7][23]} After founding the company in 1965, Stata served as the company's chairman of the board of directors since 1973, executive officer since 1996, CEO from 1973 to 1996 and president from 1971 to 1991.^[24] In addition, Stata is also a trustee of the Massachusetts Institute of Technology,^[24] his alma mater^[23] and was awarded the IEEE Founders medal in 2003.^[7] Stata received the EE Times "Lifetime Achievement" award in 2008.^[25] Stata served as the chairman of the [Semiconductor Industry Association](#) for the year 2011.^[26]

[Vincent Roche](#) became President and CEO of Analog Devices in May 2013. He first joined the company in 1988 as a marketing director in Limerick, Ireland.^{[27][28]}

[Barrie Gilbert](#) was named the first Technology Fellow of Analog Devices in 1979.^{[29][30]} In addition, Gilbert is an IEEE Life Fellow^[31] and holds over 65 patents.^[29] Gilbert is best known for the "Gilbert cell" – an electronic multiplying mixer.^[31] At Analog Devices, Gilbert started the company's Northwest Labs design center in Oregon and continued to work on RF products crafted with high-speed nonlinear circuit techniques.^[32]

[Paul Brokaw](#) is an expert on [integrated circuit design](#) who has spent most of his career at Analog Devices, where he holds the position of Analog Fellow.^[33] Brokaw is the inventor of many analog IC circuits, including the [Brokaw bandgap reference](#) and holds over 100 patents.^[34] He is also an IEEE Life Fellow.^[35]

[Robert Adams](#) is Technical Fellow^[36] and manager of audio development at Analog Devices Inc.^{[36][37]} Adams holds many patents related to the audio and electronic field.^[38] He is a member of the IEEE and a Fellow in the Audio Engineering Society.^[39] Adams received a finalist ranking for the EDN Innovation and Innovator of the Year award in 1995.^[38]

Historical

[Jerald G. Fishman](#) was the CEO and president of Analog Devices from 1996 until his death in March 2013.^[40] In 2004, Fishman was named CEO of the Year by Electronic Business. He was a 35-year veteran of Analog Devices and also served on the board of directors of Analog Devices, [Cognex Corporation](#) and [Xilinx](#).

Products and technologies

Analog Devices products include analog signal processing and digital signal processing technologies.^[41] These technologies include data converters, amplifiers, [radio frequency \(RF\)](#) technologies, [embedded processors](#) or digital signal processing (DSP) ICs, power management, and interface products.^[41]

Data converters include [analog-to-digital converters](#) (ADCs) and [digital-to-analog converters](#) (DACs)^[41] that convert electrical signal representations of real-world analog phenomena, such as light, sound, waveforms, temperature, motion, and pressure into digital signals or data, and back again.^[42] Analog Devices ADC and DAC ICs are used in [medical systems](#), scientific instrumentation, wireless and wired communications, [radar](#), industrial [process control](#), audio and video equipment, and other digital-processing-based systems, where an accurate signal conversion is critical. Data converters account for more than 50% of ADI's revenue.^[43] ADI's companion amplifier ICs provide accurate, high-speed and precise signals for driving data converters and are key for applications such as digital audio, current sensing, and precision instrumentation.^[44]

The company's data converter chips are used by [National Instruments](#) in high-precision measurement instrumentation systems.^[45] Its data converters and amplifiers are also used by scientists and researchers in project "IceCube" – an underground telescope that uses digital optical modules (DOMS) to detect subatomic particles in the South Pole.^{[46][47]}

Power management products for customers in the industrial, wireless infrastructure and digital camera markets support signal chain design requirements, such as dynamic range, transient performance, and reliability.^[48]

Interface products include a broad range of interface IC products offered by the company in product categories such as CAN (controller area network),^[49] digital isolators,^[50] level translators, LVDS, mobile I/O expander and keyboard Controller, USB, and RS-232.^[51]

Amplifiers includes precision and operational amplifiers,^[52] instrumentation,^{[53][54]} current sense, differential amplifiers,^{[55][56]} audio amplifiers, video amplifiers/buffers/filters, variable gain amplifiers, comparators, voltage, other specialty amplifiers and products for special linear functions.

Radio frequency integrated circuits (RFICs)^{[57][58]} address the RF signal chain and simplify RF system development.^[59] The company's RF portfolio includes TruPwr^[60] RMS power

detectors and logarithmic amplifiers; [PLL](#) and [DDS](#) synthesizers; RF prescalers; variable gain amplifiers; [\[61\]\[62\]\[63\]](#) ADC drivers, gain blocks, LNAs and other RF amplifiers. [\[64\]](#)

Processors and DSP are programmable signal processing integrated circuits that execute specialized software programs, or algorithms, associated with processing digitized real-time data. Analog Devices Processors and DSPs are the [Blackfin](#), [\[65\]](#) [SHARC](#), [\[66\]](#) SigmaDSP, [\[67\]](#) [TigerSHARC](#), ADSP-21xx and Precision Analog Microcontrollers. These make up the company's embedded processing and DSP portfolio, that are multi-DSP signal processing, [\[68\]](#)

Historical

Analog Devices had a line of [micro-electromechanical systems](#) (MEMS) microphones until it sold that business to [InvenSense](#) in 2013. [\[69\]](#) Analog Devices MEMS microphones were found in smart phones, tablet PCs, security systems, and medical applications. [\[70\]\[71\]](#) ADI's MEMS [accelerometers](#) were designed into game pad controllers by Microsoft, Logitech and Pellican. [\[72\]](#)

Markets

Healthcare

Analog Devices sells linear, mixed-signal, MEMS and digital signal processing technologies for medical imaging, patient monitoring, medical instrumentation and home healthcare. [\[73\]](#) The company's precision signal-processing components and Blackfin digital signal processors are included in Karmelsonix's Wholter, an overnight pulmonary monitor, and the Wheezometer, a personal asthmatic assessment device. [\[74\]](#) Accelerometers produced by Analog Devices are included in [ZOLL Medical's PocketCPR](#), which measures the depth of chest compressions and provides audible and visual feedback to a rescuer to allow adjustment to proper depth and to the correct rate of compression. [\[74\]](#)

Automotive

Analog Devices develops components for safety systems, such as stability control systems and driver assistance systems, infotainment and interior applications. [\[75\]](#) Powertrain systems in hybrid and electric vehicles use high-precision data conversion products in battery monitoring and control systems.

Industrial

Analog Devices industrial market [\[76\]](#) includes process control systems that help drive productivity, energy efficiency and reliability. [\[77\]\[78\]](#)

Consumer

Analog Devices has technology for consumer electronics, which includes signal processing circuits for image processing, auto focus, and image stabilization for digital still cameras and

camcorders, audio and video processors for home theater systems,^[79] DVD recorders, and high-definition televisions and advanced touch screen controllers for portable media devices.^[78]

Competitors

In 2009, Databeans published its report on the top semiconductor analog suppliers. Analog Devices was named number two with other suppliers including: [Texas Instruments](#), [National Semiconductor](#) (acquired by Texas Instruments in 2011),^[80] [Maxim Integrated Products](#), and [Linear Technology](#) (collaborating with Analog Devices since March 2017).^[81] Other competitors include: [Infineon Technologies](#), [STMicroelectronics](#) and [Intersil Corporation](#).^[81] In 2011, Analog Devices was the third ranked analog semiconductor supplier.^[82]

Analog Dialogue

In 1967, Analog Devices first published [Analog Dialogue](#).^[83] Dan Sheingold took the position of editor two years later, which he held for over four decades.^{[84][85]} The current editor is Scott Wayne.^[85] It is currently the longest-running in-house publication in the electronics industry.^[86]

Analog Dialogue is a forum for the exchange of circuits, systems, and software for real-world signal processing and is the technical [magazine](#) published by Analog Devices.^[86] It discusses products, applications, technology, and techniques for analog, digital, and mixed-signal processing. *Analog Dialogue* is published monthly on the Web. The featured technical articles are also compiled in quarterly print editions.

Communities

Community

In 2009, Analog Devices announced EngineerZone, an online technical support community.^[87] EngineerZone was launched so the design engineering community (customers, prospects, partners, employees and students) can ask questions, share knowledge and search for answers to their questions in an open forum.^[87]

Resources

Analog Devices **circuits from the lab reference circuits** are engineered and tested for quick system integration to help solve design challenges ranging from common to complex. Reference circuits are smaller, modular designs that are more broadly applicable than application-specific reference designs.

Each reference circuit is documented with test data, theory of operation, and component selection decision criteria. In addition, [reference circuits](#) are tailored to meet real-world system integration needs and may also include board layout schematics, CAD tools models, device drivers, and evaluation hardware.^[88]

Acquisitions

- 1969: Pastoriza Electronics^[89]
- 1971: Nova Devices^[89]
- 1978: Computer Labs^[89]
- 1984: International Imaging Systems^[90]
- 1990: [Precision Monolithics](#), Inc.^[89]
- 1991: Edsun Laboratories-Tech Assets^[90]
- 1996: Mosaic Microsystems Ltd.^[90]
- 1997: Medialight Inc.^[90]
- 1999: Edinburgh Portable Compilers^[90]
- 2000: BCO Technologies PLC,^[90] Signal Processing Associates,^[90] Integrated Micro Instruments Inc.,^[90] Chiplogic Inc. and Staccato Systems Inc.^[90]
- 2006: AudioAsics A/S,^[89] Integrant Technologies and^[89] TTPCom Ltd.-Certain Property^[90]
- 2011: Lyric Semiconductor, Inc.^[91]
- 2014: Hittite Microwave Corporation^[92]
- 2016: [Linear Technology](#)^[93], Sypris Electronics and Cyber Security Solutions Business^[94]
- 2018: Symeo GmbH^[95]
- 2019: Test Motors^[96]